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| 10/538,845 | 06/13/2005 | Toshio Nakane | 1226-110 | 2661 |

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| EXAMINER | |
|---|---|
| LISTVOYB, GREGORY | |
| **ART UNIT** | **PAPER NUMBER** |
| 1711 | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/538,845 | NAKANE ET AL. | |
| | Examiner | Art Unit | |
| | Gregory Listvoyb | 1711 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1 and 5-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 5-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/13/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Arguments*

Applicant's arguments filed 3/5/07 have been fully considered but they are not persuasive.

In the above response the Applicant stated that "composition containing a wholly aromatic polyester amide which contains no terephthalic acid but instead contains an aromatic aminophenol as the components".

In opposite, Specification of the application states: "A fourth component as a starting material monomer to be used in the first invention is (D) an aromatic dicarboxylic acid including, for example, terephthalic acid, isophthalic acid, phthalic acid, 4,4'-diphenyldicarboxylic acid, 2,6-naphthalene dicarboxylic acid, 2,3-naphthalene dicarboxylic acid, methylterephthalic acid, chloroterephthalic acid, and their derivatives."

In addition, claim 1, as written, does not exclude a presence of terephthalic acid. Claims 6 and 7 presume a presence of 2 or more dicarboxylic acids as component "D".

In reference to the Applicant's argument that "Specifically, in the Examples of Linstid III et al, no polymer containing aminophenol which further contains isophthalic acid is disclosed. That is, the wholly aromatic polyester amide as proposed by Linstid III et al is completely different structurally from that of the present invention containing an

aromatic aminophenol and isophthalic acid as the essential components" Linstid discloses that recurring unit V can be completely represented by isophthalic acid (see Claim 16).

Regarding Applicant's argument that "Furuta merely discloses blending a liquid crystal polyester (LCP) with an olefin", Furuta discloses a composition comprising 1-30% of polyolefin and 70-98% of liquid crystal (Column 10, line 10).

Regarding Charbonneau's reference "Moiety III is more preferably a dicarboxyaryl..." (Column 6, line 10, which can be represented either terephthalic or isophthalic residue. In the latter case isophthalic moiety acts as a bending monomer.

***Claim Rejections - 35 USC § 103***

Claims 1, 5, 12-25 rejected under 35 U.S.C. 103(a) as being unpatentable over by Linstid, III et al (US Patent 6222000), herein Linstid in combination and Furuta et al (US Patent 5612101), herein Furuta.

Linstid discloses amorphous wholly aromatic polyester amide exhibiting optical anisotropy obtained by copolymerizing:

A 4-hydroxybenzoic acid-15-60%, preferably 20-40%

B 2-hydroxy-6-naphtoic acid 15-60%, preferably 20-40%

C 4-aminophenol 5-20%, preferably 10-15%

D isophthalic acid 7-15 %, preferably 10-15% (see Claim 16)

E terephthalic acid 5-20% , preferably 10-15% (Columns 3-4)

Linstid teaches that his liquid crystal copolymers can be used in a composition with Polyolefins, (such as Polyethylene or modified PE) which have melting point below 230C, meeting the limitation of Claim 1. (Typical Tm for HDPE is about 140C).

The A/B ratio is always within the range of 0.15 to 4.0. The content of Isophthalic acid is always 35% or higher of content of Terephthalic acid. The content of bending monomer (Isophthalic acid) is 7-15%, meeting the limitation (2) of Claim 1.

Glass transition temperatures, of the above copolymers are about 150C (Column 6, line 5), whereas melting point Tm is not observed (Column 5, line 65). ). DSC measurements are made at 20 C/min temperature rising rate (Column 17, line 45).

Regarding Claim 2, Isophthalic acid has 1,3 phenylene skeleton.

Regarding Claims 13, 19 and 25 Linstid discloses that his copolymers are melt-processable below 270C (Column 6, line 5).

Linstid teaches that the above liquid crystal copolymers may be used in combination with polyolefins and modified polyolefins, (Example 26, Column 24 and

Column 3, line 10) for production of films, sheets, fibers, multi-layer laminates, blow-molded containers and other articles. (Column 16, line 20). Thus the limitations of Claims 12-22 and 25 are met.

Regarding Claim 23, Linstid does not specify that a polyethylene he discloses for multilayered applications is HDPE. However, such articles as bottles, tanks and containers typically producing from HDPE. HDPE has a significant advantage over LDPE in terms of mechanical strength, which is critical for the above applications.

Linstid does not teach a ratio between the resins in the composition based on the above liquid crystal copolymers Also, he fails to disclose that polyethylene in blow-molded article is high density polyethylene. In addition Linstid does not disclose that his liquid crystal composition can be processed into fuel tank. Hence the attention is directed towards Furuta. Linstid and Furuta are analogous art because they are from the same field of endeavor, utilizing liquid crystal polymers.

Furuta teaches a liquid crystal polyester resin composition film made of a liquid crystal polyester resin composition comprising (A) preferably 70 through 98% by weight of a liquid crystal polyester and (B) preferably 30 through 1% by weight of a thermoplastic resin (polyolefin, modified polyolefin, etc. (Column 10, line 10), by blown film extrusion or by laminating. The above liquid crystal polyester resin composition has an improved behavior in molten state which has been extraordinary in and drawback of the

conventional liquid crystal polyesters and is easily molded into a film with excellent mechanical strength heat resistance and gas-barrier properties and gasoline-barrier properties (Abstract).

Furuta discloses that at above ratios liquid crystal polymer forms a continious phase and other thermoplast forms a disperse phase. With increased content of thermoplast a moldability deteriorates and mechanical strength and barrier properties lowers. (Column10, line 15)

Therefore, it would have been obvious to a person with ordinary skills in the art to combine liquid crystal and thermoplastic resin in order to improve physical properties of a final molded article. In order to obtain excellent mechanical properties, typical for liquid crystal copolymers it is important that liquid crystal polymer forms a continuous phase and other thermoplast forms a disperse phase. When the amount of dispersed phase exceeds 25-30%, two continuous phases formed. In this case values of most important mechanical properties, such as Young modulus, decrease. Therefore, it is important to keep a content of thermoplastic polymer in the composition below 30% wt.

Regarding Claim 23, Furuta discloses that polyethylene in his composition is high density polyethylene (HDPE) (Example 6, column 17).

Since HDPE has much better mechanical properties than LDPE due to its higher crystallinity it would have been obvious to a person with ordinary skills in the art to use HDPE for high end applications, such as large blow molded containers.

Regarding Claim 24, Furuta discloses that his composition can be processed into a fuel tank (Comparative Example 6, Column 18).

Since Linstid composition has an exceptional mechanical and barrier properties and ability to be processed by blow molding, it would have been obvious to a person with ordinary skills in the art to use a composition based on Linstid copolymers for manufacturing of fuel tanks.

Claims 6-10 rejected under 35 U.S.C. 103(a) as being unpatentable over Charbonneau et al (US Patent 4351918), herein Charbonneau in combination with Furuta

Charbonneau discloses liquid crystal copolymer comprising 40% 4-hydroxybenzoic acid, 20% 2-hydroxy-6-naphtoic acid, 20% terephthalic acid (or isophthalic acid Column 6, line 15), 5% p-phenylenediamine and 20% 2,6 dihydroxyanthraquinone Glass transition temperature, measured by DSC at temperature rising rate of 20C/min is 122C, whereas distinctive Tm transition is not observed (Column 17, Example 6). Therefore, limitations (1) to (5) of claim 1 are met.

Regarding Claims 7-10, Charbonneau teaches that terephthalic acid can be completely replaced by isophthalic acid.(which have 1, 3 phenylene skeleton) In this case the ratio of isophthalic acid in D is 100%.

Charbonneau does not teach a composition based on the above copolymer. Hence attention is directed to Furuta. Charbonneau and Furuta are analogous art since they are from the same field of endeavor, utilizing liquid crystal copolymers.

Furuta teaches a liquid crystal polyester resin composition film made of a liquid crystal polyester resin composition comprising (A) preferably 70 through 98% by weight of a liquid crystal polyester and (B) preferably 30 through 1% by weight of a thermoplastic resin (polyolefin, modified polyolefin, etc. (Column 10, line 10)

The above liquid crystal polyester resin composition has an improved behavior in molten state which has been extraordinary in and drawback of the conventional liquid crystal polyesters and is easily molded into a film with excellent mechanical strength heat resistance and gas-barrier properties (Abstract). Furuta discloses that at above ratios liquid crystal polymer forms a continuous phase and other thermoplast forms a disperse phase. With increased content of thermoplast a moldability deteriorates and mechanical strength and barrier properties lowers. (Column10, line 15)

Therefore, it would have been obvious to a person with ordinary skills in the art to combine liquid crystal and thermoplastic resin in order to improve physical properties of a final molded article. In order to obtain excellent mechanical properties, typical for liquid crystal copolymers it is important that liquid crystal polymer forms a continuous phase and other thermoplast forms a disperse phase. When the amount of dispersed phase exceeds 25-30%, two continuous phases formed. In this case values of most important mechanical properties, such as Young modulus, decrease. Therefore, it is important to keep a content of thermoplastic polymer in the composition below 30% wt.

In addition, liquid crystal copolymers are very expensive. Partially replacing them with inexpensive polyolefin has a significant economical advantage.

Claim 11 rejected under 35 U.S.C. 103(a) as being unpatentable over Linstid and Furuta as applied to claims 6-10 above, and further in view of Hiroshi (JP publication 03-284726).

Charbonneau does not teach that liquid crystal resin contains 1,3 phenylenediamine. Hence attention is directed to Hiroshi. Charbonneau and Hiroshi are analogous art since they are from the same field of endeavor, utilizing liquid crystal copolymers.

Hiroshi discloses a composition based on liquid crystal oriented film comprising dicarboxylic acid and 15 or more weight percent of 1,3-phenylenediamine. This

composition has the large tilt angle and good adhesive properties, when combined with a substrate.

Therefore, it would have been obvious to a person with ordinary skills in the art to use 1,3-phenylenediamine in Charbonneau's liquid crystal and thermoplastic resin composition in order to improve adhesiveness between layers in the composition.

Charbonneau does not teach a composition based on a liquid crystal resin.

Furuta teaches a composition based on liquid crystal polymer and modified polyolefin (see Furuta discussion above).

***Double patenting***

Claims 1-5 and 12-25 provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-14 of copending Application No. 10/525,642 in view of Furuta (see Furuta discussion above).

Although the conflicting claims are not identical, they are not patentably distinct from each other because the application claim the composition based on the same liquid crystal polymer as in the Application 10/525,642.

This is a provisional obviousness-type double patenting rejection.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregory Listvoyb whose telephone number is (571) 272-6105. The examiner can normally be reached on 9am-6pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James Seidleck can be reached on (571) 272-1078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Gregory Listvoyb
Examiner
Art Unit 1711

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James J. Seidleck
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